MODIS diurnal thermal bands analyses for hot spot detection and classification

Claudia Kuenzer[*1], Jianzhong Zhang[*], Chris Hecker[+], and Wolfgang Wagner[*]

**1: Institute of Photogrammetry and Remote Sensing, TU Vienna, Gusshausstr. 27-29, A-1040, Vienna, Austria, email: ck@ipf.tuwien.ac.at, all authors except Chris Hecker same institute*

[+]*: ITC,* International Institute for Geo-Information Science and Earth Observation (ITC), 7500 AA, Enschede, The Netherlands

Abstract

In this paper we present the analyses results of diurnal MODIS data analysis for thermal anomaly and hot spot detection. Results are presented based on thermally anomalous areas in coal fire- as well as forest fire regions. MODIS holds a great potential for hot spot detection and the detection of thermally anomalous regions as well as for the classification of these anomalies with respect to temperature intensity. This is due to two great advantages of MODIS. Firstly, data is acquired up to five times a day for an area, since the sensor is available on the platforms AQUA and TERRA. Thus, for an area of interest it is possible to acquire morning-, afternoon-, evening-, night- and pre-dawn data on the same day or within the range of only a few days. This allows the analyses of thermal imagery with varying background temperature conditions, which allows for precise anomaly extraction. Furthermore, MODIS has several thermal bands – located in the mid-infrared as well as in the thermal infrared. The analyses of these individual bands as well as the investigation of artificially created ratio bands allows for the separation of relatively warm anomalies against outstanding hot spots. For anomaly extraction we employ an automated histogram based algorithm for anomaly extraction, which grants unbiased and repeatable results. Our results show that is clearly possible to detect subtle coal fire related thermal anomalies of coal fire regions even in low resolution thermal MODIS data. Furthermore, related anomalies can be grouped into “normal” warm anomalies as well as outstanding hot spots. For forest fire related thermal images it is also possible to automatically extract and classify anomalous pixels according to their intensity without the need to apply biased manual thresholding techniques.

Keywords: coal fires, forest fires, natural hazards, MODIS, diurnal thermal data, thermal anomalies, hot spots